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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/020,217	12/18/2001	Paul A. Hoisington	09991-019001	5731
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FISH & RICHARDSON P.C. 1425 K STREET, N.W. 11TH FLOOR WASHINGTON, DC 20005-3500			FEGGINS, KRISTAL J	
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DATE MAILED: 04/23/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/020,217	Applicant(s) HOISINGTON ET AL. 	
	Examiner K. Feggins	Art Unit 2861	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 January 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 12, 16-19 and 23-47 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 37-40 is/are allowed.
- 6) ☒ Claim(s) 12, 16-19, 23-36, 41-47 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 12, 16, 19, 23-29 & 34-36, 41, 45 & 47 are rejected under 35 U.S.C. 102(e) as being anticipated by Kanaya et al. (US 6,217,158 B1, IDS).

Kanaya et al. disclose the following claimed limitations:

* regarding claims 12 & 41, a method of depositing ink/apparatus disclose method/ (col 6, lines 28-29);

* delivering ink to an ink chamber (col 7, lines 27-32, col 8, lines 19-26, figs 8a, 8b);

* applying a jetting voltage across a first electrode/discrete electrodes, 4/ and a second electrode/discrete electrodes, 4/(also see fig 1a, 1b) on a face of a stiffened/curved/ piezoelectric element/vibrator unit/ to subject ink within the chamber to a jetting pressure, thereby depositing ink from an exit orifice (36 of fig 8a & 8b) of the ink chamber (23 of fig 8a & 8b), the curved surface having a substantially constant radius of

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curvature and being concave relative to the ink chamber (col 4, lines 10-18, col 7, lines 27-40, 55-62, figs 6a & 6b, 7, 8a & 8b).

* regarding claims 41, wherein the curved surface/elastic plate, 1/ is concave relative to the ink chamber (col 8, lines 20-24, figs 8a & 8b),

* regarding claims 16, 23 & 42, wherein the piezoelectric element/elastic plate/ includes lead zirconium titanate/PZT/(col 4, lines 1-5, 50-55).

*regarding claim 19, an ink jet printing module/an ink jet recording head with a piezoelectric vibrator unit/ (col 7, lines 63-64, figs 8a & 8b);

* an ink chamber/pressure generating ink chamber, 23/ (col 7, lines 32-40, figs 7b, 8a & 8b);

* a stiffened/curved/ piezoelectric element/vibrator unit/ having a region exposed to the ink chamber (figs 6a, 7a, 7b, 8a & 8b), the piezoelectric element/vibrator unit/ being positioned over the ink chamber/pressure generating ink chamber, 23/ to subject ink within the chamber to jetting pressure, wherein the region of the stiffened piezoelectric element exposed to the ink chamber has a curved surface, the curved surface having a substantially constant radius of curvature and being concave relative to the ink chamber (col 7, lines 33-54, figs 8a, 8b, 5-7, 9-14);

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* electrical contacts/electrodes, 4/ arranged on a single surface of the piezoelectric element/vibrator unit/ for activation of the piezoelectric element (col 4, lines 10-18, col 7, lines 27-40, 55-62, figs 1a, 6a, 6b, 8a, 8b & 13).

* regarding claims 24 & 44, wherein the piezoelectric element has a thickness of 5 to 300 microns/5 μ or larger/ (col 6, lines 42-46).

* regarding claims 25 & 43, wherein the piezoelectric element has a thickness of 10 to 250 microns/5 μ or larger/ (col 6, lines 42-46).

* regarding claims 26 & 45, wherein the piezoelectric element has a thickness of less than 100 microns/5 μ or larger/ (col 6, lines 42-46).

* regarding claim 27, wherein the chamber has a width of less than 1200/150/ microns (col 6, lines 32-39).

* regarding claims 28 & 47, wherein the chamber has a width of 50 to 1000/150 to 210/ microns (col 6, lines 32-39).

* regarding claim 29, wherein the chamber has a width of 100 to 800/150 to 210/ microns (col 6, lines 32-39).

* regarding claim 34, a series of chambers (col 11, lines 24-26, figs 21, item 23).

* regarding claim 35, wherein each of the chambers/23/ is covered by a single piezoelectric element/piezoelectric vibrator unit, 5/ (col 4, line 1-2, col 11, lines 60-65 figs 1a, 6, 7a, 7b, 8a, 8b, 21).

* regarding claim 36, wherein the chamber includes a wall contacting the piezoelectric element/piezoelectric vibrator unit/ exposed to the ink chamber at an angle of greater than ninety degrees (col 7, lines 63-65, col 8, lines 19-23, see figs 8a & 8b).

* further regarding claim 41, electrical contacts are arranged on a surface of the piezoelectric element distal to the ink chamber for activation of the piezoelectric element (col 4, lines 10-18, col 7, lines 27-40, 55-62, figs 1a, 6a, 6b, 8a, 8b & 13).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kanaya et al. (US 6,217,158 B1, IDS) in view of Watanabe et al. (US 6361154 B1).

Kanaya et al. disclose all of the claimed limitations except for the following:

* wherein the substantially constant radius of curvature is less than 5 millimeters

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Watanabe et al. discloses the following claimed limitation:

* wherein the substantially constant radius of curvature is less than 5 millimeters (col 3, lines 61-64, col 6, lines 34-35, figs 1-2, 5) for the purpose of improving the productivity as far as possible by suppressing the occurrence of cracks and the like in the vibration plate and the piezoelectric devices.

It would have been obvious at the time of the invention was made to a person having ordinary skill in the art to utilize a curved surface that has a radius of curvature of less than 5 millimeters, taught by Watanabe et al. into Kanaya et al. for the purpose of improving the productivity as far as possible by suppressing the occurrence of cracks and the like in the vibration plate and the piezoelectric devices.

5. Claims 17, 30-33 & 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kanaya et al. (US 6,217,158 B1, IDS) in view of Yamamuro et al. (US 4,700,203).

Kanaya et al. disclose the following:

* low drive voltage (col 8, lines 66-67)

Kanaya et al. does not disclose the following claimed limitations:

* wherein the jetting voltage is less than 60 volts

* wherein the curved surface has a radius of curvature of 500 to 3000 microns.,

* wherein the curved surface has a radius of curvature of 1000 to 2800 microns

* wherein the curved surface has a radius of curvature of 1500 to 2600 microns

* wherein the electrodes/conductive or electrode layer, 84/ are configured to apply a voltage of less than 60 volts

Yamamuro et al. disclose the following claimed limitation:

* regarding claims 17, wherein the jetting voltage is less than 60 volts/50 volts/ (col 5, line 43) for the purpose of providing an ink jet head which is operable on relatively low voltages.

* regarding claims 30 & 46, wherein the curved surface has a radius of curvature of 500 to 3000 microns/10.7 to 42.7mm/ (col 5, lines 43-55, Table 1) for the purpose of providing an ink jet head capable of compressing ink to eject a drop of ink.

* regarding claim 31, wherein the curved surface has a radius of curvature of 1000 to 2800 microns/10.7 to 42.7mm/ (col 5, lines 43-55, Table 1) for the purpose of providing an improved ink jet head.

* regarding claim 32, wherein the curved surface has a radius of curvature of 1500 to 2600 microns/10.7 to 42.7mm/ (col 5, lines 43-55, Table 1) for the purpose of providing an ink jet head which allows a minimum of load to act on the substrate adapted to support the ink support means.

* regarding claim 33, wherein the electrodes/conductive or electrode layer, 84/ are configured to apply a voltage of less than 60 volts/50 volts/ (col 5, lines 43, 49, 66-68) for the purpose of providing an ink jet head which has little least susceptibility to dielectric breakdown.

It would have been obvious at the time of the invention was made to a person having ordinary skill in the art to utilize a jetting voltage is less than 60 volts; a curved surface that has a radius of curvature of 500 to 3000 microns; a curved surface that has a radius of curvature of 1000 to 2800 microns; a curved surface that has a radius of curvature of 1500 to 2600 microns; and electrodes are configured to apply a voltage of less than 60 volts, taught by Yamamuro et al. into Kanaya et al. for the purposes of providing an ink jet head which is operable on relatively low voltages, providing an ink jet head capable of compressing ink to eject a drop of ink, providing an improved ink jet head, providing an ink jet head which allows a minimum of load to act on the substrate adapted to support the ink support means and providing an ink jet head which has little least susceptibility to dielectric breakdown.

Allowable Subject Matter

6. Claims 37-40 are allowed.

The following is an examiner's statement of reasons for allowance: The primary reason for the allowance of claims 37-40 is the inclusion of the method steps of depositing ink that includes a stiffened piezoelectric element that has a region spanning the ink chamber and being substantially completely exposed to the ink chamber, the

exposed region having a curved surface over the ink chamber, the curved surface having a substantially constant radius of curvature and being concave relative to the ink chamber. It is these steps found in the claims, as they are claimed in the combination of which has not been found, taught or suggested by the prior art of record that makes these claims allowable over the prior art.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Kitahara et al. (US 5,856,837) disclose an ink jet head with a convex vibrating plate. Motoba et al. (US 5,684,519) disclose an ink jet where the center portion of the ink discharge plate is deformed towards the nozzle.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Response to Arguments

7. Applicant's arguments filed January 21, 2004 have been fully considered but they are not persuasive.

In response to Applicant's arguments that Kanaya et al. does not disclose a method of depositing ink using a stiffened piezoelectric element where the stiffened piezoelectric element has a curved surface over the ink chamber, the curved surface having a substantially constant radius of curvature and being concave relative to the ink chamber is acknowledged. However, Kanaya et al. does disclose a method of depositing ink using a stiffened piezoelectric element where the stiffened piezoelectric

element has a curved surface over the ink chamber, the curved surface having a substantially constant radius of curvature and being concave relative to the ink chamber (see figs 8a & 8b) and a first and second electrodes on the face of a piezoelectric element. There is nothing in the claims that states the first and second electrodes are on the same face of the piezoelectric element. Figures 8a & 8B shows a stiffened/curved/ piezoelectric element having a curved surface over the ink chamber, and the curved surface having a substantially constant radius of curvature and being concave relative to the ink chamber and a region of the stiffened piezoelectric element is exposed to the ink chamber has a curved surface. The region exposed to the ink chamber is the sides of the piezoelectric element, see figs 8a & 8b, col 8, lines 19-26.

Conclusion

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of


the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Communication With The USPTO

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to K. Feggins whose telephone number is 571-272-2254. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Meier can be reached on 571-272-2149. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


K. Feggins
April 19, 2004